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ABSTRACT

Interest in occupational stress in older employees can be expected to increase in the future. Among the more widely documented sources of stress at work are those associated with demands of the job. Laboratory research in gerontology shows a disproportionate effect on older persons of increased work task demands. Naturalistic studies also suggest the unique susceptability of the older employee in perceptually demanding jobs, though the relevance of these naturalistic data to modern jobs needs confirmation. Job design may be an important supportive measure to reduce occupational stress with age. In this regard the micro-structure of the job is an important element in age-related difficulties in workload stress. Stimulus response compatibility, the presence of irrelevant information, the need to divide attention while performing a task, and the level of discretionary control of the task are all micro-structured aspects of the task that are likely to affect workload demands on the older employee. For these reasons, careful task design with training and overall systems design are appealing and humane answers to the problem of workload stress at older ages. (Author/NRB)

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# WORKLOAD AND STRESS IN THE OLDER EMPLOYEE

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# Workload and Stress in the Older Employee

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Interest in the topic of occupational stress and workload stress in older employees has been stimulated by several clear demographic and occupational trends. Among these have been the fact that the U.S. work force is aging. Based on 1978 figures from the Department of Labor, the median age of the U.S. Labor force will increase about seven years in the next 15 to 20 years. This is true despite a lack of evidence that the work force beyond the ages of 60 or 65 will appreciably grow as a result of the elimination of manditory retirement and adverse economic conditions.

There has also been the broadening appreciation that stress is an important work related problem in highly industrialized nations (Beehr and Newman, 1978). A large and compelling body of evidence links occupational stress (and stress in general) with physical and mental disease. Also, it is generally assumed that occupational stress may influence organizational effectiveness (Beehr and Newman, 1978, House, 1976).

Although there is little direct evidence, there is indirect evidence that stress may uniquely impact the older employee (Eisdorfer and Wilkie, 1977). While there is plenty of evidence that sources of occupational stress have significant consequences for health, productivity, and job satisfaction, what we would like to know, as regards the older employee, is whether these effects interact with age in non-trivial ways. That is, in ways of significance for the design of jobs and work environments or organizational policies and decisions.

Unfortunately there is little direct evidence with which to answer this question. This should not be surprising since few if any areas of occupational gerontology have a substantive empirical base. The best we can do at present is make intuitive translations from the laboratory or social research data and occasionally support this with naturalistic observations made in the work place.

## Job and Task Demands

Among the more widely documented sources of stress at work is that associated with demands of the job. At one time many jobs probably

involved substantial physical strain, but this is much less common in modern jobs where task demands are made on information processing and psychomotor skills, so-called "mental workload".

Welford (1958) conceptualized the relationship between age and demand requirements as shown in the capacity model of Figure 1. According to this model, achieved performance at different ages depends upon task demand and potential capacity. In general, capacity is seen to decrease with age and at some point, depending upon task demands, becomes a limiting factor.

Figure 1

The general efficacy of this model relating laboratory task workload with age has been empirically demonstrated many times. Typical is a study we conducted that varied workload and assessed speed of response and several psychophysiological measures (Michalewski, Thompson, Smith, Patterson, Litzelman, Brent, 1980). Briefly, the experiment consisted of a constant period, forewarned reaction time task. A group of elderly ($\bar{x}$ age = 72.2) and a group of young ($\bar{x}$ age = 23.3) subjects each took part in three conditions. In one (Control 1) there was only the response time taken. In another (Divided Attention) consonant-vowel-consonant trigrams were presented to the subject during the warning period and following the response (to $S_2$) the subjects recalled the trigrams. A third condition (Control 2) was identical to the latter, except subjects were not requested to recall the trigrams. Figure 2 presents the curves for response time.

Figure 2

Note the disproportionate effect on response time with increasing task load for older subjects. That older subjects were exerting a comparable effort was suggested by the contingent negative variation (CNV) which can be viewed as a CNS measure of attentional or cognitive effort. The CNV amplitude was the same for young and old despite the performance difference. Indeed it has been documented in a wide variety of laboratory tasks that increasing task loading affects older ages disproportionately more than younger ages (Eisdorfer, Axelrod, and Wilkie, 1963; Arnold and Farkas, 1978; Simon, 1968).

Do such laboratory observations have analogies in the work context? Task demands may be implicated in naturalistic reports that older employees in blue-collar jobs may take steps to simplify the job or to work more continuously, with fewer and shorter pauses and with various signs of hurrying. They also are less apt to be found in perceptual demanding jobs. Possibly these form the basis for the common practice of assigning older employees to self-paced jobs rather than machine-paced jobs. Even where the older employee is able to compensate for a falling capacity by increased effort it may be that work is done in a state of chronic stress. Unfortuantely, the observations on which these naturalistic data are based is old and their application to modern jobs needs confirmation. We need to know a great deal more about the extent to which workload stress is implicated in job attrition, early retirement, job related psychosomatic conditions and personnel desisions at older ages.

## Workload Intervention by Job Design

Modern systems with their increasing complexity, their transient demands for high workload and their frequent requirements for change emphasize the need to incorporate age-related criteria into occupational job and task design, training and the development of job aids.

Sometimes it may be possible to reduce age-related difficulties in workload by changing the micro-structure of the task. Some examples of this are:

Stimulus Response Compatibility. Here the issue is one of designing jobs so as to emphasize the compatibility between stimulus and response. S-R compatibility in job design, both as regards efficient performance and its interface with stress, is a well recognized principle in industrial and human engineering but an even more important issue for the older worker. From the earliest research in gerontology it has been clear that workload is severely degraded for the older adult as the number of mental operations that he must perform increases (Welford, 1958; Simon, 1968).

Irrelevant Information. A second design objective is revealed by studies conducted since the mid-1960's showing disproportionate age decrements in the ability to disregard information that is irrelevant to the main task. (Farkas and Hoyer, 1980; Jordon and Rabbitt, 1977; Klauser and Klein, 1978; Rabbitt, 1964; 1965; Wright and Elias, 1979).

An experiment by Hoyer, Rebok, and Sved (1979) illustrated this. Sixty young ($\bar{X}$ = 20.6), middle-aged ($\bar{X}$ = 52.6) and elderly ($\bar{X}$ = 72.6) persons performed a task matching two stimulus arrays to a standard.

On each trial, one dimension (form, color, shape or number) of the stimulus was relevant and three dimensions were irrelevant. The irrelevant dimensions could be either constant or variable thus altering the complexity of the task. The authors reported that old persons were disproportionately slowed by the presence of irrelevant stimuli compared to younger ages.

Divided Attention. A third design objective comes from evidence such as shown earlier that age invokes a severe penalty on workload capacity where attention must be divided in performing two tasks concurrently (Talland, 1962) or when divided between two input sources (Schoenfield, Truman, and Kline, 1972).

Discretionary Task Control. One other aspect of job micro-structure is deserving of careful consideration in job design. A number of authors have distinguished two senses in which job micro-structure may vary and their interaction seems to be important in determining job stress. Figure 3 models these two dimensions; the discretionary control of how the job is performed and job demands.

Figure 3

Karasek (1979) has shown in large-scale social surveys that adjectives used to describe jobs can be separated into these two dimensions each relatively independent of the other. He has recently presented epidemological data indicating that occupations classified as high demand, low control were associated with increased incidence of cardio-vascular and other stress related disease. O'Hanlon (1981) has presented evidence from 11 industrialized nations showing high stress in repetitive jobs of short cycle time and excessively high catecholamine secretion, such as assembly line operators, process controllers, and deep sea workers, in contrast to jobs of high control and high demand. Closely related are observations that indicate that performance feedback can significantly modify the stress of a demanding task (Manenica, 1977; Salvendy, et al, 1979).

Whether these observations from the general field of stress research have unique implications at older ages remains uncertain. We do know from laboratory studies that persons over 50 have some specific problems with paced tasks (Brown, 2957), that performance improves when the difficulty and temporal demands of paced tasks are lessened (Davis, 1968; Eisdorfer, Axelrod, and Wilkie, 1963) that older persons benefit more from self pacing than younger ages (Canesteari, 1968), and that the older person shows a greater stress reaction to a paced task as indicated by biochemical measures of autonomic arousal (Powell, Eisdorfer, and Bogdonaff, 1964).

## Conclusion

There is reason to believe that with increasing systems complexity, an aging work force and the proportionately greater effects of task loading on older persons, that age-related workload issues will increase in the future. It might be supposed that it will be most simple to restrict older ages from jobs of higher task demands as has been the case with some specific occupations such as air traffic controllers, pilots and bus drivers. However, emerging judicial and regulatory opinion, not to mention public opinion, would seem to indicate that individual "job rights" will increasingly be upheld. For such reasons, supportive measures, such as training, system design and design of the micro-structure of tasks are appealing and humane answers to the problem of workload stress at any age.

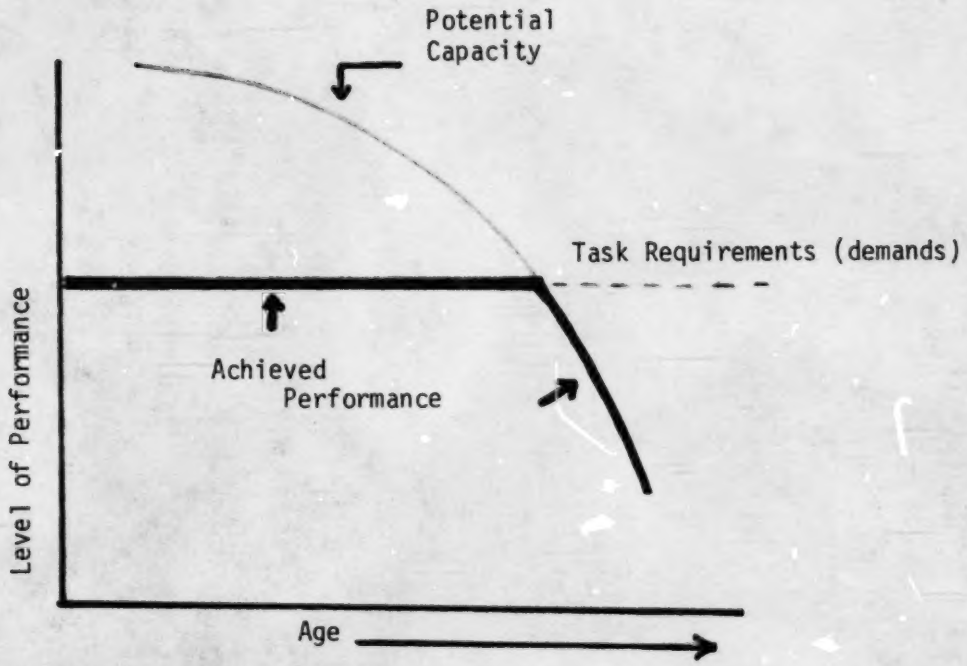


FIGURE 1. Relationship between capacity and task demands for the limiting factor of age.
(Adapted from Welford, 1958)

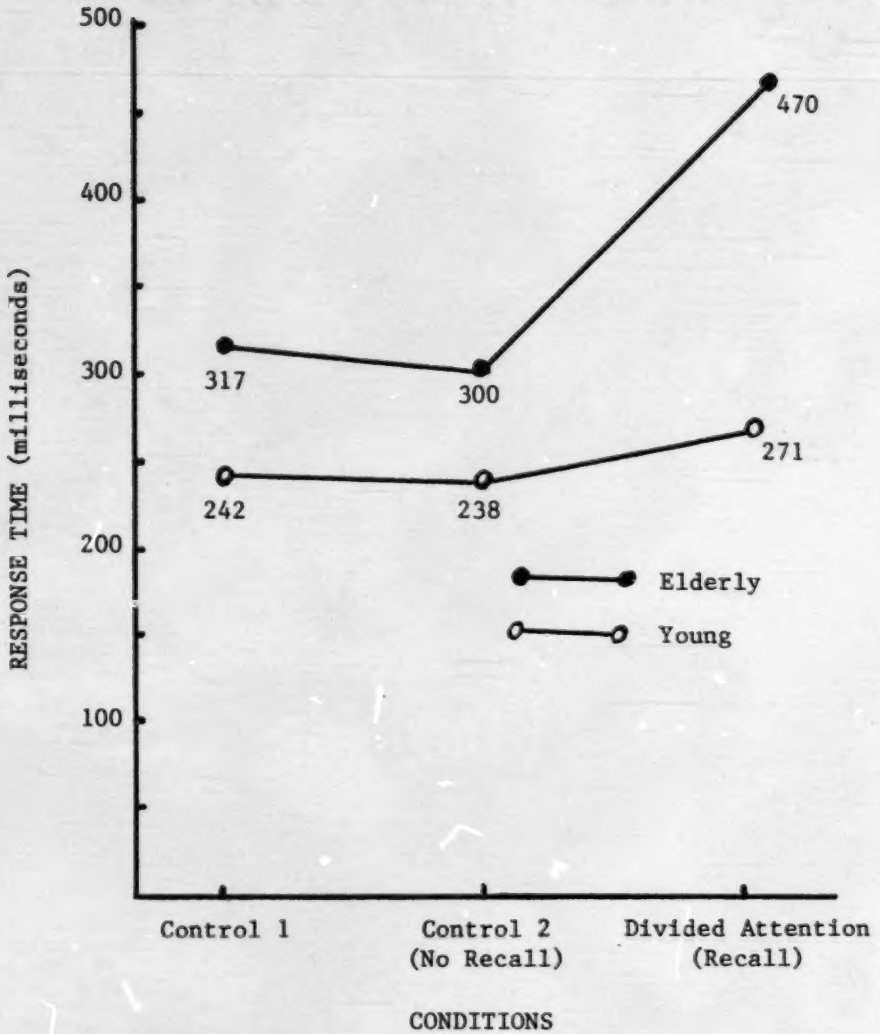


Figure 2. Note the disproportionate increase in response time under the divided attention condition. (Michalewski, Thompson, Smith, Patterson, Litzelman, and Brent, Journal of Gerontology, 1980).

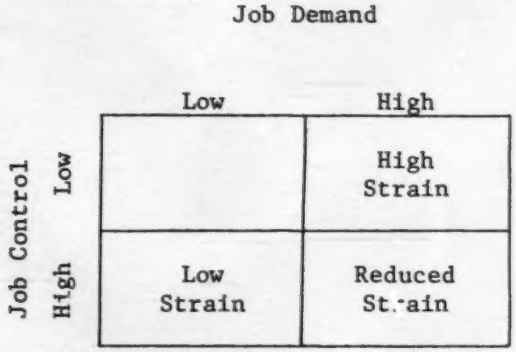


Figure 3. Dimensions of Job Microstructure: Job Demand and Job Control (the discretionary control of how the job is performed).

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